

REMARKS

Election/Restrictions.

5 The Office Action stated that "it appears claims 28, 32, 34, and 35 are not part of the species intended to be examined by the Applicant, but directed to Embodiment 6. Therefore, claims 28, 32, 34 and 35 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, there being no allowable generic or linking claim."

10 Applicant submits that, as discussed below, Applicant has provided replacement drawings for Figures 1, 3-5, 7-10, and 25-26, to clearly show the features claimed in Claims 28, 32, 34 and 35. Furthermore, independent Claim 23 has been amended, to include means for providing energy to at least one of the electromagnets.

15 Applicant therefore submits that Claim 23, as amended, and as fully supported by the Application as filed, as discussed below, and as seen at least in replacement Figures 1, 3-5, 7-10, and 25-26, provides a generic or linking claim for currently withdrawn claims 28, 32, 34, and 35. Applicant requests that, upon
20 allowance of generic Claim 23, that claims 28, 32, 34 and 35, which depend from or otherwise include each of the limitations of Claim 23, be rejoined.

Drawing Objections.

25 2. The drawings are objected to under 37 CFR 1.83(a). The Office Action stated that the "drawings must show every feature of the invention specified in the claims. Therefore, means for storing energy recovered from at least one of the electromagnets of Claim 28, the power source and regenerative braking system of Claim 32, the software module of Claim 34 and means to partially open and then close the valve of Claim 35 must be shown or the feature(s) cancelled from
30 the claim(s). No new matter should be entered."

The Office Action also stated that the “drawings are objected to because the poor rendering and hand written reference numbers of figures 25 and 26 make it hard to identify the elements of applicant’s invention”.

- 5 Applicant has provided a complete set of replacement formal drawings, in compliance with 37 CFR 1.121(d), to provide proper line and reference character quality, and to provide proper margins.

10 Applicant has provided replacement drawings for Figures 1, 3-5, 7-10, and 25-26, to clearly show the features claimed in Claims 28, 32, 34 and 35.

Support is seen in the Application as filed, at least on page 6, lines 1-5; on page 8, line 35 to page 9, line 3; on page 9, lines 8-10,14-24, 28-30 and 34-38; on page 10, line 1 to page 11, line 7; on page 12, lines 17-32; on page 15, lines 15-16 and 35-36; on page 16, lines 8-13; on page 17, lines 8-9; on page 18, lines 19-32; on page 19, lines 11-16; on page 22, lines 25-27 and 35-38; on page 26, lines 16-26; on page 27, lines 1-8; on page 28, lines 1-19 and 30-35; and in Figure 11, Figure 12, and Figure 13.

- 20 Applicant there submits that the drawings, as amended and as supported by the Application as filed, show every feature of the invention specified in the claims, and thus overcome the objections under 37 CFR 1.83(a).

35 U.S.C. § 102. Claim Rejections.

- 25 **3.** Claims 23-26, 31, 33, and 37 are rejected under 35 U.S.C. §102(e) as being anticipated by Yanai (U.S. Patent No. 6,634,327).

Applicant has amended independent Claim 1, to claim a valve system, comprising:

- 30 a valve assembly linearly movable between a closed position and an open position;

a valve spring which is compressed by the valve assembly when the valve assembly is located in the open position, and is uncompressed when the valve assembly is located in the closed position;

5 a disable spring which is compressed by the valve assembly when the valve assembly is located in the closed position, and is uncompressed when the valve assembly is located in the open position;

at least one electromagnet;

at least one permanent magnet having a magnetic field;

10 a clapper affixed to the valve assembly and movable in relation to the electromagnet and the permanent magnet; and

means for providing energy to each of at least one of the electromagnets for any of attracting the clapper and repelling the clapper;

15 wherein the magnetic field from at least one of the permanent magnets provides an attractive latching force to the clapper when the valve assembly is in any of the closed position and the open position; and

wherein the energy means provides energy to decrease a local magnetic flux to repel the clapper and provide a soft landing at any of the closed position and the open position.

20 Support is seen in the Application as filed, at least on page 6, lines 1-5; on page 8, line 35 to page 9, line 3; on page 9, lines 8-10,14-24, 28-30 and 34-38; on page 10, line 1 to page 11, line 7; on page 12, lines 17-32; on page 15, lines 15-16 and 35-36; on page 16, lines 8-13; on page 17, lines 8-9; on page 18, lines 19-32; on page 19, lines 11-16; on page 22, lines 25-27 and 35-38; on page 26,
25 lines 16-26; on page 27, lines 1-8; on page 28, lines 1-19 and 30-35; and in Figures 1-13 and 25-26.

Yanai describes an apparatus and method for detecting change of neutral position of an electromagnetic valve actuation system, and an apparatus and
30 method for controlling the valve, as seen at least in the Abstract, wherein:

5 "A valve is urged in the valve-opening direction by an upper spring and in
the valve-closing direction by a lower spring. The valve is thus urged to a
neutral position where the respective urging forces are balanced. The
valve is controlled to be released from one of two terminal positions, that
is, the full-open position or the full-closed position, and to be attracted to
the position from which the valve has been released. The displacement
pattern of the valve during this period is sensed by a displacement
amount sensor, whereby the maximum displacement amount of the valve
from that terminal position is measured. The change of the neutral
10 position is detected based on the change of the measured maximum
displacement amount with respect to a reference value."

Applicant submits that, although Yanai describes valve latching, Yanai does not
disclose an energy means which "provides energy to decrease a local magnetic
15 flux to provide a soft landing at any of the closed position and the open position."

A description of valve latching in Yanai is seen, at least in col. 7, line 61 to col. 5,
line 37, wherein:

20 The lower core 36 has an annular second groove 36h at the surface
opposite to that facing the armature 34. The second groove 36h is formed
concentrically about the valve shaft 4. An annular permanent magnet 36m
is mounted in the second groove 36h. The magnetic force of the
permanent magnet 36m acts as an attraction between the armature 34
25 and the first electromagnet 36e (lower core 36). Therefore, when the
armature 34 gets close to the first electromagnet 36e, the attraction
attracts the armature 34 toward the lower core 36 against the urging force
(elastic force) of the lower spring 14. Because of the magnetic force of the
permanent magnet, the armature 34 is kept in contact with the lower core
30 36 even when a drive current for the first electromagnet 36e is small
enough, or even when the drive current is zero while the engine is
stopped. When the armature 34 is thus in contact with the lower core 36,
the valve element 2 is located farthest away from the valve seat 16. In
other words, the exhaust valve 1 is fully opened. This position of the
35 exhaust valve 1 corresponds to the "full-open position".

5 The upper core 38 has an annular first groove 38H at the surface facing the armature 34. The first groove 38H is formed concentrically about the valve shaft 4. An annular upper coil 38c is mounted in the first groove 38H. The upper coil 38c and the upper core 38 form an electromagnet (second electromagnet) 38e for driving the exhaust valve 1 in the valve-closing direction.

10 The upper core 38 has an annular second groove 38h at the surface opposite to that facing the armature 34. The second groove 38h is formed concentrically about the valve shaft 4. An annular permanent magnet 38m is mounted in the second groove 38h. The magnetic force of the permanent magnet 38m acts as an attraction between the armature 34 and the second electromagnet 38e (upper core 38). Therefore, when the armature 34 gets close to the second electromagnet 38e, the attraction
15 attracts the armature 34 toward the upper core 38 against the urging force of the upper spring 24. Because of the magnetic force of the permanent magnet 38m, the valve element 2 is kept seated on the valve seat 16 even when a drive current for the second electromagnet 38e is small enough, or even when the drive current is zero while the engine is
20 stopped. When the valve element 2 is thus seated on the valve seat 16, the exhaust valve 1 is fully closed. This position of the valve element 2 corresponds to the "full-closed position."

25 While the Office Action states, in regard to Claim 25 as filed, that Yanai also discloses means for providing energy to at least one of the electromagnets (40, col. 6, lines 6-58, Applicant therefore submits that there is no disclosure or suggestion in Yanai, express or implied, of an energy means which "provides energy to decrease a local magnetic flux to provide a soft landing at any of the closed position and the open position", nor is there a description as to how to
30 implement such a system.

Applicant therefore submits that independent Claim 23, as amended, overcomes the rejection under 35 U.S.C. §102(e) as being unpatentable over Yanai (U.S. Patent No. 6,634,327).

- 5 As dependent claims 24-27, 29-31, 33, and 36-41 depend from amended independent Claim 23, and inherently contain all the limitations of the claims they depend from, they are seen to be patentable as well.

10 As well, Applicant has amended dependent Claim 26, to claim the valve system of Claim 23, wherein the energy means is controllable to provide energy to a single of the electromagnets for both attracting the clapper and repelling the clapper during a single movement toward any of the closed position and the open position.

- 15 Support is seen in the Application as filed, at least on page 13, line 4 to page 14, line 37; on page 26, lines 16-21; and in Figures 7, 8, 25, and 26.

20 Applicant submits that Yanai fails to disclose an energy means which is controllable to provide energy to a single of the electromagnets for both attracting the clapper and repelling the clapper during a single movement toward any of the closed position and the open position. As well, there is no suggestion, express or implied, that Yanai be modified to meet the Claim 26, as amended.

25 Thus, Applicant therefore submits that dependent Claim 26 overcomes the rejection under 35 U.S.C. §102(e) as being unpatentable over Yanai (U.S. Patent No. 6,634,327).

35 U.S.C. § 103. Claim Rejections.

- 30 4. Claim 27 is rejected under 35 U.S.C. §103(a) as being unpatentable over Yanai (U.S. Patent No. 6,634,327), as applied to Claim 23 above, in view of Lequesne (U.S. Patent No. 4,829,947).

As discussed above, Applicant has amended independent Claim 23, to claim a valve system, comprising:

a valve assembly linearly movable between a closed position and an open position;

5 a valve spring which is compressed by the valve assembly when the valve assembly is located in the open position, and is uncompressed when the valve assembly is located in the closed position;

a disable spring which is compressed by the valve assembly when the valve assembly is located in the closed position, and is uncompressed when the valve assembly is located in the open position;

at least one electromagnet;

10 at least one permanent magnet having a magnetic field;

a clapper affixed to the valve assembly and movable in relation to the electromagnet and the permanent magnet; and

means for providing energy to each of at least one of the electromagnets for any of attracting the clapper and repelling the clapper;

15 wherein the magnetic field from at least one of the permanent magnets provides an attractive latching force to the clapper when the valve assembly is in any of the closed position and the open position; and

20 wherein the energy means provides energy to decrease a local magnetic flux to repel the clapper and provide a soft landing at any of the closed position and the open position.

Support is seen in the Application as filed, at least on page 6, lines 1-5; on page 8, line 35 to page 9, line 3; on page 9, lines 8-10,14-24, 28-30 and 34-38; on page 10, line 1 to page 11, line 7; on page 12, lines 17-32; on page 15, lines 15-
25 16 and 35-36; on page 16, lines 8-13; on page 17, lines 8-9; on page 18, lines 19-32; on page 19, lines 11-16; on page 22, lines 25-27 and 35-38; on page 26, lines 16-26; on page 27, lines 1-8; on page 28, lines 1-19 and 30-35; and in Figures 1-13 and 25-26.

30 Lequesne describes variable lift operation for a “bistable electromechanical poppet valve actuator”, as seen at least in the Abstract, wherein:

5 “A valve actuating device for an internal combustion engine is operated
with partial valve lift. The valve is spring biased toward a neutral central
position but held in full open or closed positions by permanent magnets
having associated coils. Normal activation of the valve between full open
and closed positions is by activation of a coil to fully cancel the field of the
associated magnet with a spring moving the valve to the other position.
Partial lift operation comprises providing, with the valve in its closed
position, a valve opening current to the valve opening coil to reduce the
closing magnetic field but stopping the current before the valve reaches its
10 full open position and providing a valve closing current to one of the coils
to cause the return of the valve to its closed position. Two modes of partial
lift operation are described: a first in which valve movement is continuous
with valve opening duration substantially proportional to valve lift and a
second in which the valve is moved to a stable half lift position, left in this
15 position for an arbitrary duration, and pulled back into the closed position.”

While Lequesne discloses the use of permanent magnet latches, as seen at
least in Abstract, Applicant submits that there is no disclosure or suggestion in
Lequesne, express or implied, of an energy means which “provides energy to
20 decrease a local magnetic flux to provide a soft landing at any of the closed
position and the open position”, nor is there a description as to how to implement
such a system.

Applicant therefore submits that, even in combination, Yanai and Lequesne fail
25 to meet independent Claim 23, as amended. As well, there is no suggestion,
express or implied, that Yanai and/or Lequesne be modified to meet the claims.

As well, Applicant has amended dependent Claim 27, to claim the valve system
of Claim 23 wherein the at least one permanent magnet comprises a single
30 permanent magnet that provides the attractive latching force to the clapper when
the valve assembly is in any of the closed position and the open position.

Support is seen in the Application as filed, at least on page 14, lines 1-37; on
page 27, lines 1-8; and in Figures 7, 8, 25, and 26.

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Thus, Applicant submits that independent Claim 23, as amended, overcomes the rejection under 35 U.S.C. 103(a) over Yanai (U.S. Patent No. 6,634,327), as applied to Claim 23 above, in view of Lequesne (U.S. Patent No. 4,829,947). As Claim 27 depends from Claim 23, it is seen to be patentable as well.

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5. Claims 29, 30, 36, 40 and 41 and are rejected under 35 U.S.C. §103(a) as being unpatentable over Yanai (U.S. Patent No. 6,634,327).

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As discussed above, Applicant has amended independent Claim 23, to claim a valve system, comprising:

- a valve assembly linearly movable between a closed position and an open position;

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- a valve spring which is compressed by the valve assembly when the valve assembly is located in the open position, and is uncompressed when the valve assembly is located in the closed position;

- a disable spring which is compressed by the valve assembly when the valve assembly is located in the closed position, and is uncompressed when the valve assembly is located in the open position;

20

- at least one electromagnet;

- at least one permanent magnet having a magnetic field;

- a clapper affixed to the valve assembly and movable in relation to the electromagnet and the permanent magnet; and

- means for providing energy to each of at least one of the electromagnets for any of attracting the clapper and repelling the clapper;

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- wherein the magnetic field from at least one of the permanent magnets provides an attractive latching force to the clapper when the valve assembly is in any of the closed position and the open position; and

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- wherein the energy means provides energy to decrease a local magnetic flux to repel the clapper and provide a soft landing at any of the closed position and the open position.

Support is seen in the Application as filed, at least on page 6, lines 1-5; on page 8, line 35 to page 9, line 3; on page 9, lines 8-10,14-24, 28-30 and 34-38; on

page 10, line 1 to page 11, line 7; on page 12, lines 17-32; on page 15, lines 15-16 and 35-36; on page 16, lines 8-13; on page 17, lines 8-9; on page 18, lines 19-32; on page 19, lines 11-16; on page 22, lines 25-27 and 35-38; on page 26, lines 16-26; on page 27, lines 1-8; on page 28, lines 1-19 and 30-35; and in
5 Figures 1-13 and 25-26.

While the Office Action states, in regard to Claim 25 as filed, that Yanai also discloses means for providing energy to at least one of the electromagnets (40, col. 6, lines 6-58, Applicant therefore submits that there is no disclosure or
10 suggestion in Yanai, express or implied, of an energy means which "provides energy to decrease a local magnetic flux to provide a soft landing at any of the closed position and the open position", nor is there a description as to how to implement such a system.

15 Applicant submits that it would require significant modification and undue experimentation, not taught in Yanai, to meet Claim 23, as amended.

Applicant therefore submits that that independent Claim 23, as amended, overcomes the rejection under 35 U.S.C. 103(a) over Yanai (U.S. Patent No.
20 6,634,327), as applied to Claim 23 above. As Claims 29, 30, 36, 40, and 41 depend from Claim 23, they are seen to be patentable as well.

6. Claims 38 and 39 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yanai (U.S. Patent No. 6,634,327), as applied to Claim 23 above, in view of
25 Smith et al. (U.S. Patent No. 6,798,323).

As discussed above, Applicant has amended independent Claim 23, to claim a valve system, comprising:

a valve assembly linearly movable between a closed position and an open
30 position;

a valve spring which is compressed by the valve assembly when the valve assembly is located in the open position, and is uncompressed when the valve assembly is located in the closed position;

a disable spring which is compressed by the valve assembly when the valve assembly is located in the closed position, and is uncompressed when the valve assembly is located in the open position;

at least one electromagnet;

5 at least one permanent magnet having a magnetic field;

a clapper affixed to the valve assembly and movable in relation to the electromagnet and the permanent magnet; and

means for providing energy to each of at least one of the electromagnets for any of attracting the clapper and repelling the clapper;

10 wherein the magnetic field from at least one of the permanent magnets provides an attractive latching force to the clapper when the valve assembly is in any of the closed position and the open position; and

wherein the energy means provides energy to decrease a local magnetic flux to repel the clapper and provide a soft landing at any of the closed position
15 and the open position.

Support is seen in the Application as filed, at least on page 6, lines 1-5; on page 8, line 35 to page 9, line 3; on page 9, lines 8-10, 14-24, 28-30 and 34-38; on page 10, line 1 to page 11, line 7; on page 12, lines 17-32; on page 15, lines 15-
20 16 and 35-36; on page 16, lines 8-13; on page 17, lines 8-9; on page 18, lines 19-32; on page 19, lines 11-16; on page 22, lines 25-27 and 35-38; on page 26, lines 16-26; on page 27, lines 1-8; on page 28, lines 1-19 and 30-35; and in Figures 1-13 and 25-26.

25 Smith et al. describes a welded AC electromagnet lamination assembly incorporating a shading coil, as seen at least in the Abstract, wherein:

“An electromagnetically actuable device has a magnetic core proximate
an armature and a coil selectively energized to draw the armature to the
30 magnetic core. The armature and magnetic core are of laminated magnetic steel and have mating surfaces. At least one of the armature and magnetic core includes conductive weld or braze lines for integrally

securing laminations together to define a conductive path proximate the mating surface to provide a shading coil.”

5 While Smith et al. describes the use of laminated cores, there is no disclosure or suggestion in Smith et al., express or implied, of an energy means which “provides energy to decrease a local magnetic flux to provide a soft landing at any of the closed position and the open position”, nor is there a description as to how to implement such a system.

10 Applicant therefore submits that, even in combination, Yanai and Smith et al. fail to meet independent Claim 23, as amended. As well, there is no suggestion, express or implied, that Yanai and/or Smith et al. be modified to meet the claims.

15 Thus, Applicant submits that independent Claim 23, as amended, overcomes the rejection under 35 U.S.C. 103(a) over Yanai (U.S. Patent No. 6,634,327), as applied to Claim 23 above, in view of Smith et al. (U.S. Patent No. 6,798,323). As Claim 38 and 39 depend from Claim 23, as amended, they are seen to be patentable as well.

20 **7. Other Amendments.**

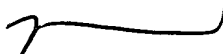
Applicant has amended dependent Claims 24-27, 32-35, and 38-39, to provide proper antecedent terminology to the claims they depend from.

25 Applicant has also amended dependent Claim 36, to correct a minor grammatical error.

CONCLUSION

Applicant respectfully submits that the Figures, as amended, overcome the objections set forth in the Office Action. Applicant also respectfully submits that Claim 23, as amended, and dependent claims 24-27, 29-31, 33, and 36-41 overcome the rejections set forth in the Office Action. Applicant also submits that the amendments do not introduce new matter into the Application. Based on the foregoing, Applicant considers the invention to be in condition for allowance. Applicant earnestly solicits the Examiner's withdrawal of the rejections set forth in the prior Office Action, such that a Notice of Allowance is forwarded to Applicant, and the present application is therefore allowed to issue as a United States patent.

Respectfully Submitted,



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Amendments to the Figures

In Figure 1, 3-5, 7-10, and 25-26, please add elements 302, 304, 352, 354, 356, 358, 370, and 372, and shown in the replacement drawings.

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In Figure 4, please properly locate the lead line associated with reference character 24, as shown in the replacement drawing.

10 In Figure 9, please add the lead line associated with reference character 36b, as shown in the replacement drawing.